CONCLUSIONS

The study of the implements used in Afghanistan shows that many of the types used there are not as efficient as modern implements. The farmers realized this after seeing demonstrations performed with modern small implements, and they wanted to acquire them. It is obvious, therefore, that there is a definite need for improved equipment.

Implements and machines for Afghanistan should be cheap, easy to handle easy to repair, solid, of good quality, and suitable for manual labour or for animal draft, whichever is the custom. The introduction of too many different types of implements would cause confusion. The use of only those types which are actually proved to be really useful should be promoted.

Under the agricultural conditions obtaining in Afghanistan the most suitable and promising hand tools are obviously scythes, cradles and hoes. It would seem advisable that the local farmers receive further training in the use of these.

Weeding and mulching of soil are absolutely essential if yields are to be increased, and this work should be facilitated by the use of pulling hoes. Whether these can be used or not depends on whether crops are planted in rows. Therefore, one or two types of pulling hoes should be tried in the future. An implement which is most essential, both for making rows, and in the interest of seed economy, is the seed drill. Demonstrations and tests with simple seed drills would likewise be of great value.

In most countries, and Afghanistan is no exception, the work of grain threshing could be greatly lightened and waste avoided if simple threshers were used. Simple fan mills would also lead to great improvement in the sorting of grain.

The requirements set out above should be given due consideration when future demonstrations are being organized.

V.

ILLUSTRATIONS

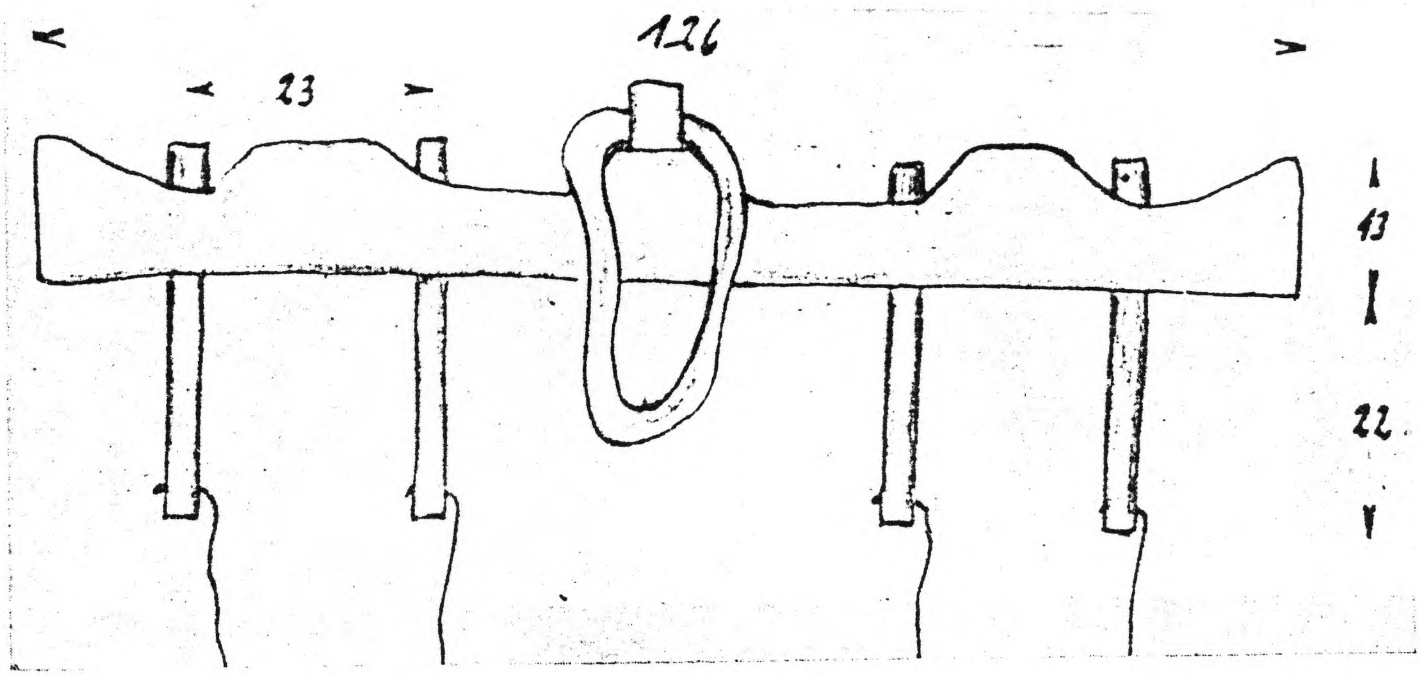


Fig. 1. *Afghan Yoke, made of light, soft wood (willow or poplar). The withers hump of the oxen lets the bare yoke sit firmly*



Fig. 2. *Oxen threshing. The straps of the yoke are too tight around the animal's throat*

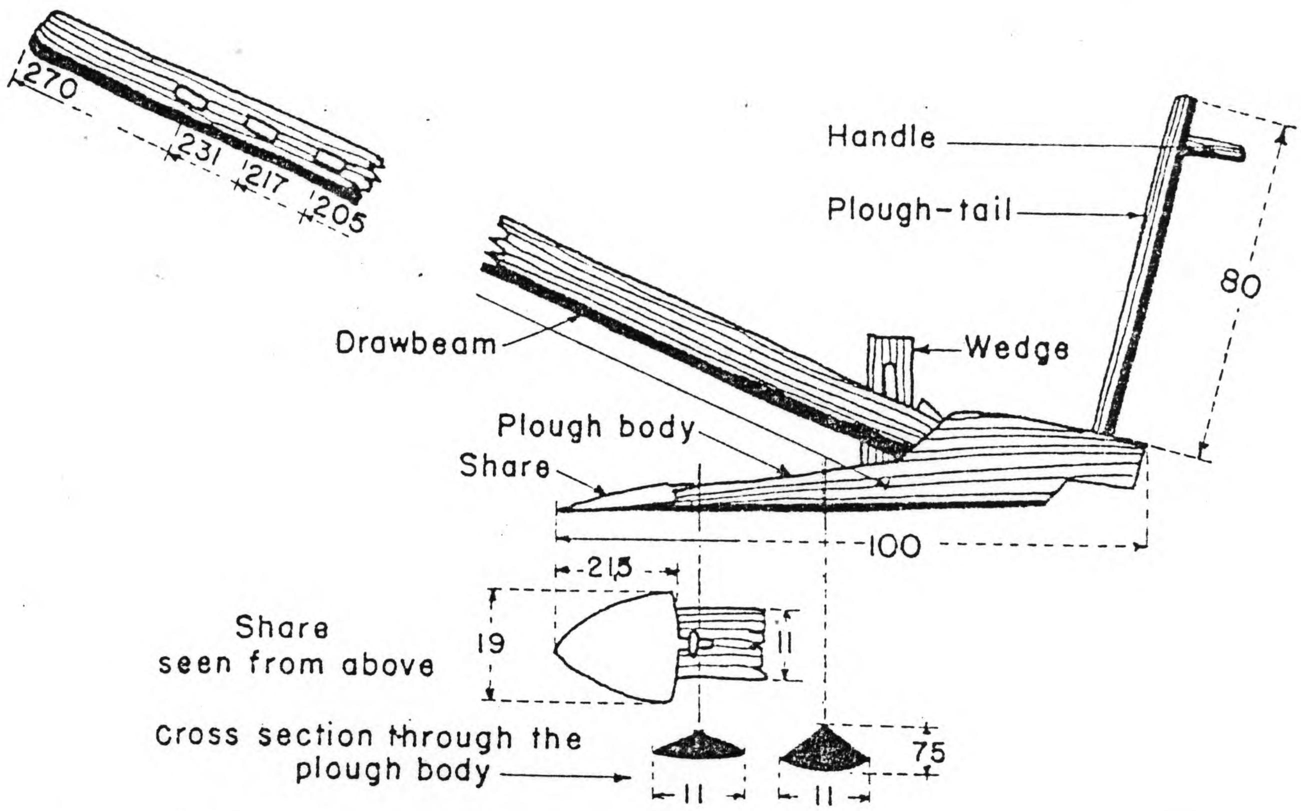


Fig. 3. *Type of plough used in Kaleakasi (Kabul Province). Iron share is flat and heart-shaped. The body and drawbeam are made of hard wood (Fraxinus, Eleagnus). Beam and handle of soft poplar wood (Populus pyramidalis). Weight of plough with drawbeam 20 to 25 kg. There are slits in the front end of the beam for a wedge to hold a strap which keeps yoke and drawbeam together. The wedge is inserted into the hole in the front, center or rear according to depth required*



Fig. 4. *Afghan plough used in Jarasia (Kabul Province)*



Fig. 5. *Ploughing in the Jardeh Plain near Kabul. Plantation of Populus pyramidalis along the watercourses*



Fig. 6. *Ploughing at Massai (Kabul Province). Plots are small and terraced*

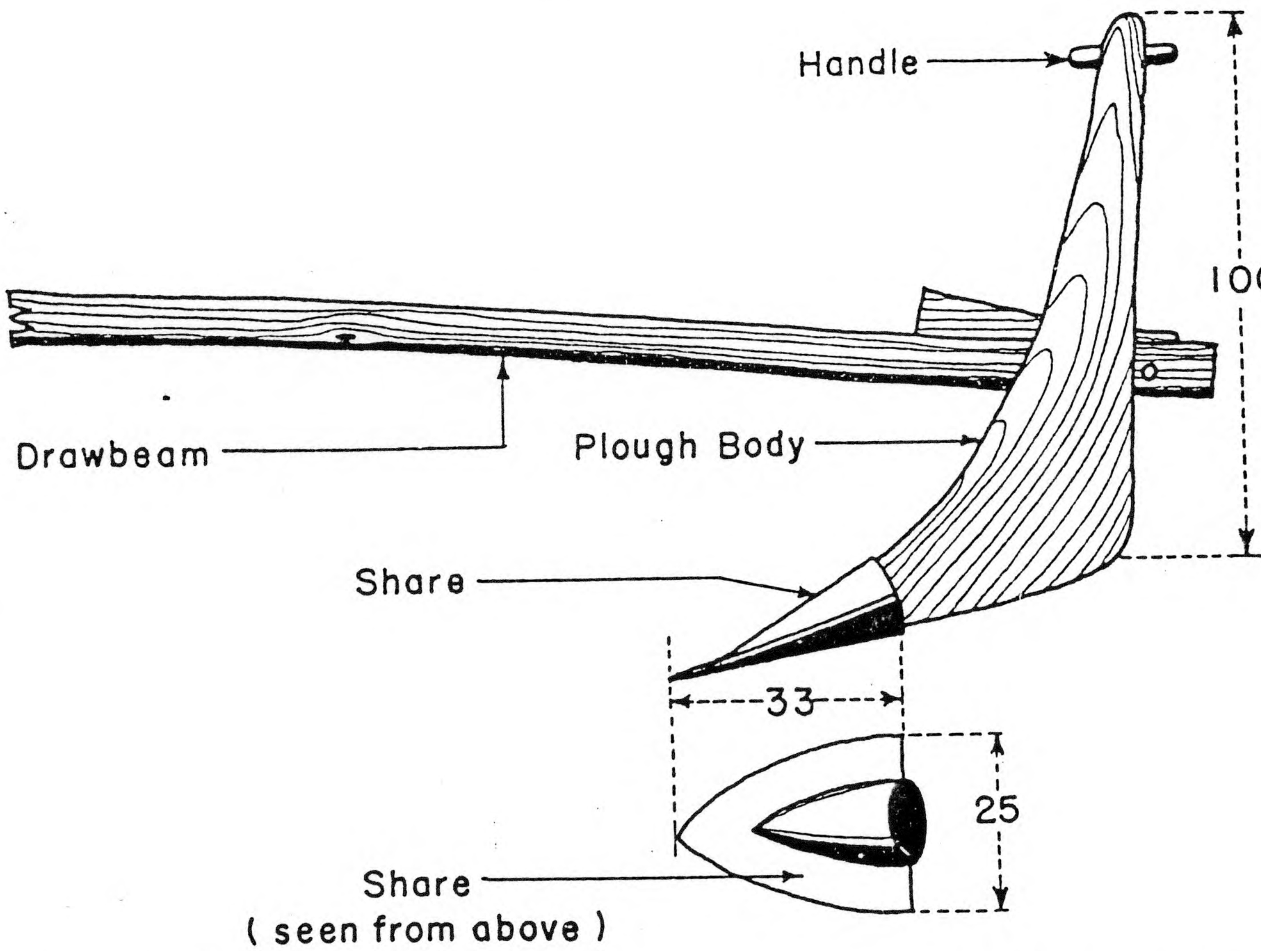
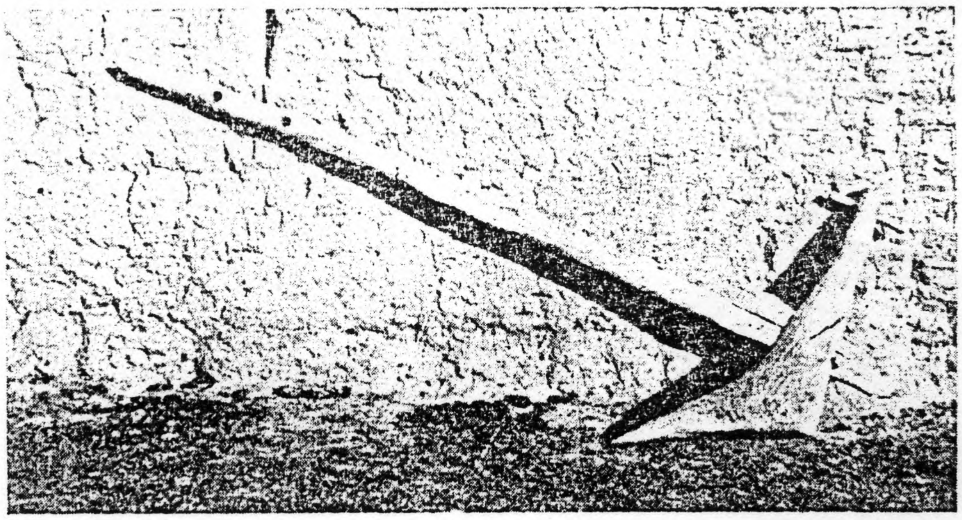


Fig. 7. *Type of plough used in Kunduz (Kataghan Province). Share is cone-shaped with lateral wings*



Fig. 8. *Peasant in the Eastern Province with plough and implements*

Fig. 9. *Type of plough used in the Province of Kataghan. A share has to be fixed to the point of the plough*



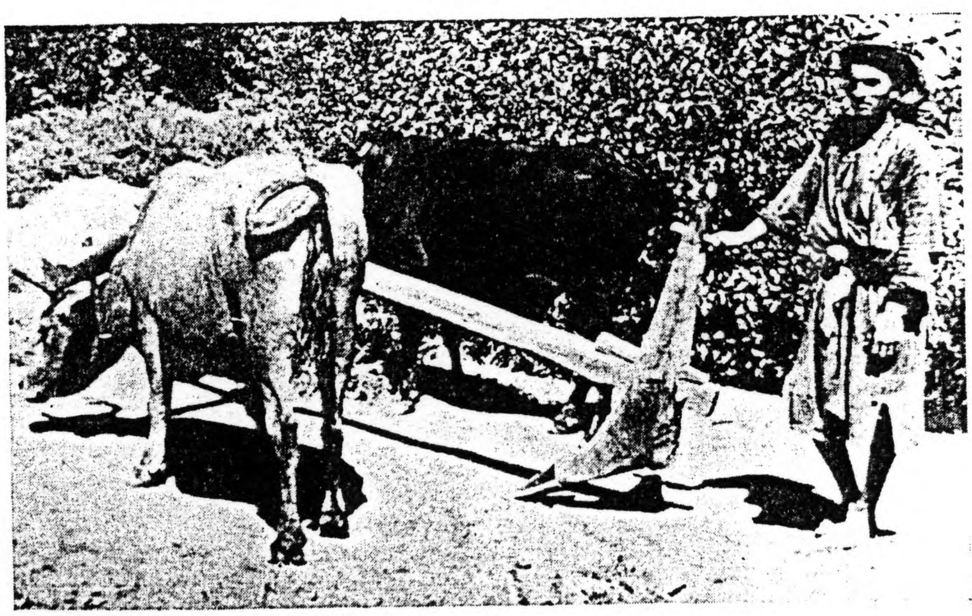


Fig. 10. *Ploughing team in Kunduz (Kataghan Province)*

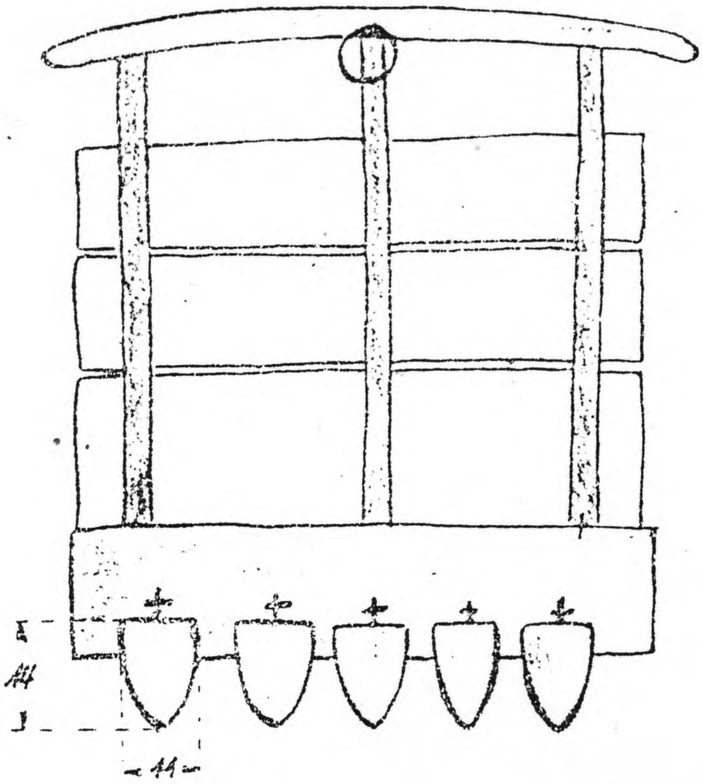


Fig. 11 (a) *Shovel harrow (Rakol) with iron shovels*

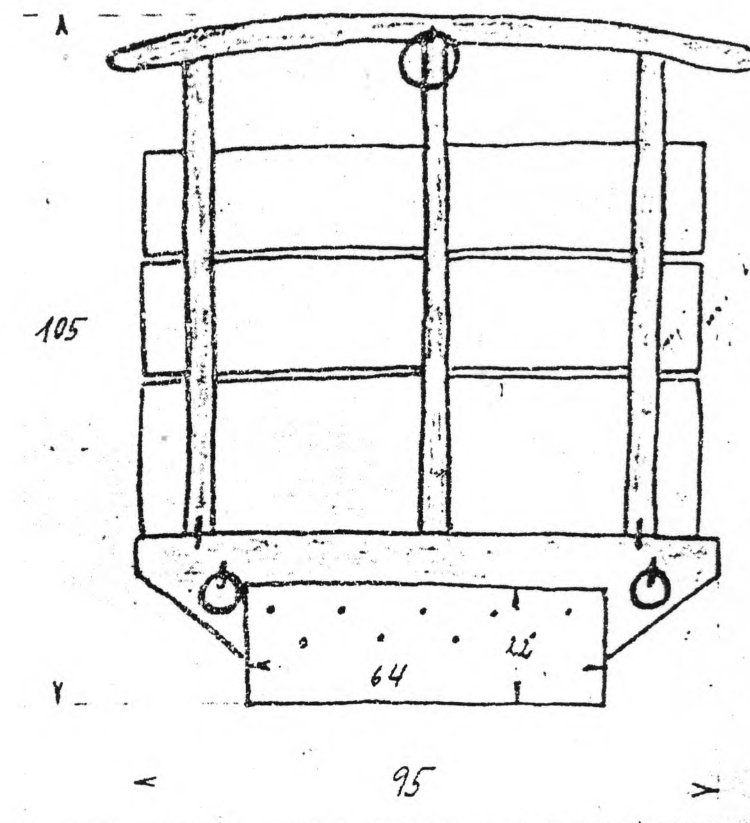


Fig. 11. (b) *Shovel harrow (Rakol) with iron plate*

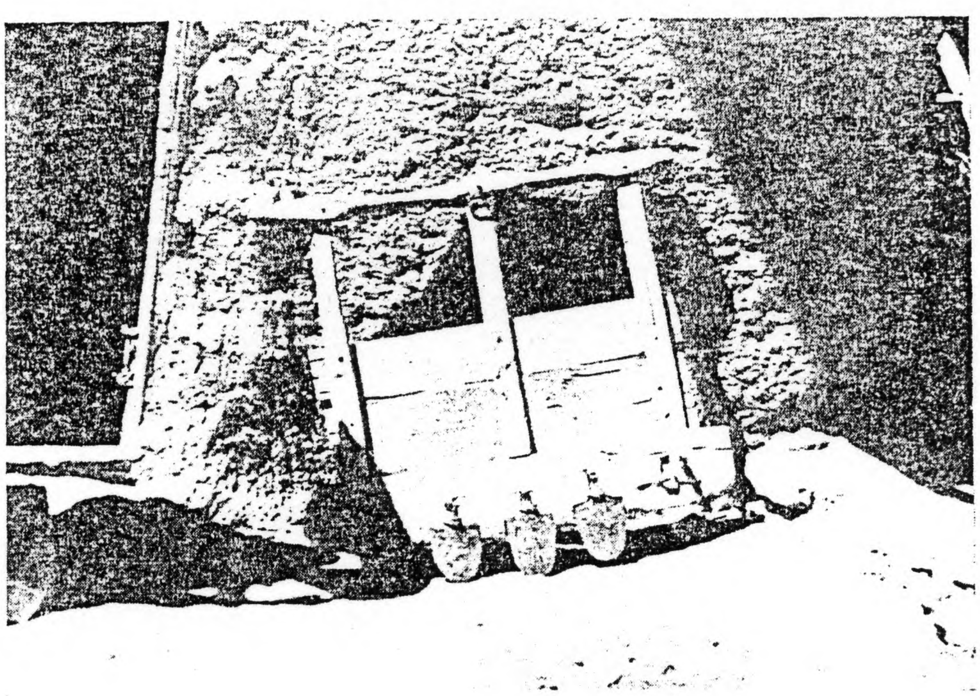


Fig. 12. *Shovel harrow (Rakol) used in Jarasia. The fifth shovel on the right is broken off*

Fig. 13. *Farmer working with shovel harrow (Rakol)*



INTRODUCTION

Afghanistan is primarily an agricultural country, in which industry is just beginning to develop. The introduction of modern agricultural techniques would undoubtedly increase food production, and because Afghanistan obtains its foreign currency solely by the export of agricultural products, an increased production of food would greatly benefit the economy of the country.

In most parts of the country there is no rain from Spring until the beginning of Winter. Fields are usually artificially irrigated. Climatic conditions are very favorable for the effective use of modern hoeing implements. The Afghan farmer can begin harvesting just when the plants have reached the right degree of ripeness; furthermore, he can spread out harvesting operations over a long period of time.

Agricultural conditions in general favor the use of small implements rather than large machinery, for the following reasons:

(a) Small farm plots of irregular shape. Intensive agricultural cultivation is limited to regions with watercourses. For irrigation the basin system is usually used. Every plot of land is in the shape of a flat basin with a low edge. Hilly country makes terracing necessary. The steeper the slope, the smaller the terraces and the smaller the plots. The average size of plots on slopes is about 400 to 800 sq. metres (480 to 960 square yards). As the farmer, when making terraces, has to follow the shape of the plots, the individual plots are usually of uneven shape.

(b) Subsistence farming dominates. There are many small and medium farmers in Afghanistan, who generally grow sufficient for their own needs, but not much for the market. Consequently, they have little ready money available and cannot purchase expensive machinery. Furthermore, the use of large agricultural machiner on small farms would not be economical.

Afghanistan's agricultural production could be increased in various ways: the yield per acre by better cultivating methods and by the use of better seed and fertilizers; and the total production by growing crops on land hitherto uncultivated. With the existing farming methods this would need more labor. But there is no surplus of unemployed agricultural workers in Afghanistan. Parts of the country are even underpopulated. So the required increase of production could be achieved only by more efficient methods. Working capacity per man could be increased through improvement in agricultural implements and through the introduction of new types of tools at present lacking.

It was with this end in view that FAO and the Government of Afghanistan concluded an agreement, under the Expanded Technical Assistance Program, for the demonstration and study of small implements during the 1951 growing and harvesting season in Afghanistan.



Fig. 14. *Levelling board (Mahla) at work*

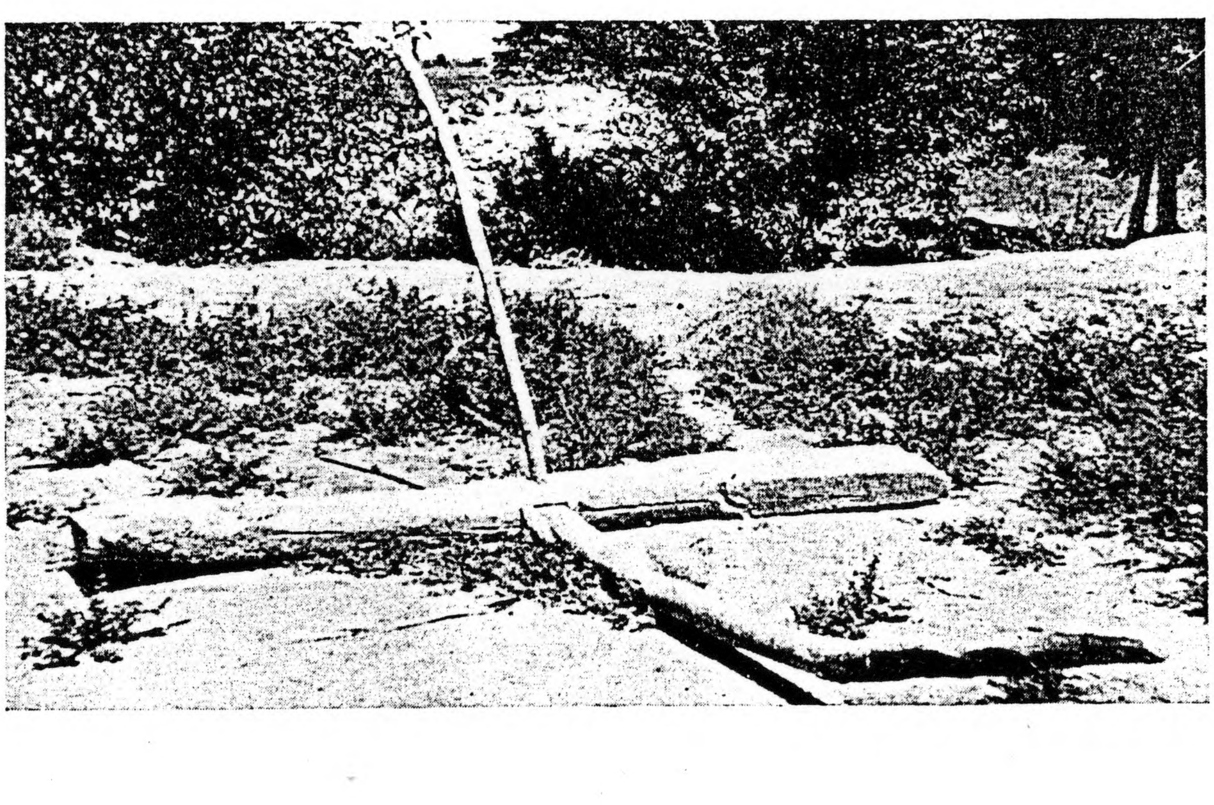


Fig. 15. *Levelling crossbeam*

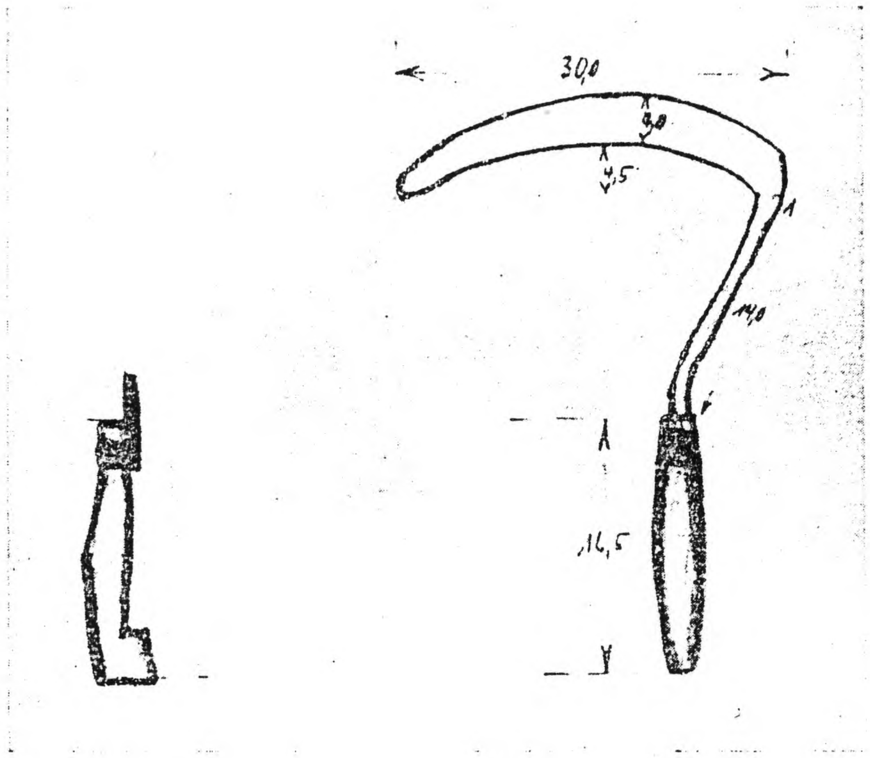


Fig. 16. (above) *Sickle used in the Province of Kabul*



Fig. 17. (right) *Farmer in Paghman (about 2300 m. above sea level) near Kabul, with short-handled sickle*



Fig. 18. (above) *Mowing wheat with sickle*



Fig. 19. (above, right) *Farmers at Bamian mowing wheat*



Fig. 20. (right) *Typical shape of short-handled sickles*



Fig. 21. *Blacksmith at Laghman (Eastern Province) hammering a sickle. At his left a water basin in which the sickles are hardened*



Fig. 22. *Blacksmith in Khanabad attaching the handle of a sickle (Kataghan Province)*





Fig. 23. (left) *Mower from Aliabad near Kabul with long-handled sickle. Length of handle 41 cm., of shaft 27 cm., of blade 45 cm.*

Fig. 24. (above, right) *Mower at work. He holds the handle with both hands and has to bend down. He mows against the standing corn and pushes the swath along with his left leg. Sometimes he wraps rags around his leg for protection*

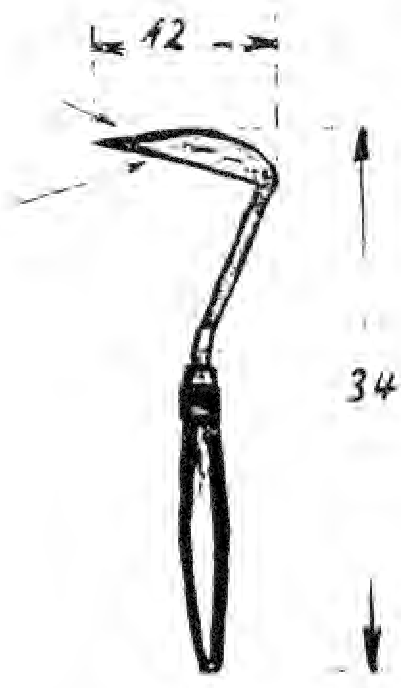


Fig. 25. *Weeding Sickle (Kala) used in the Prov. of Kabul*

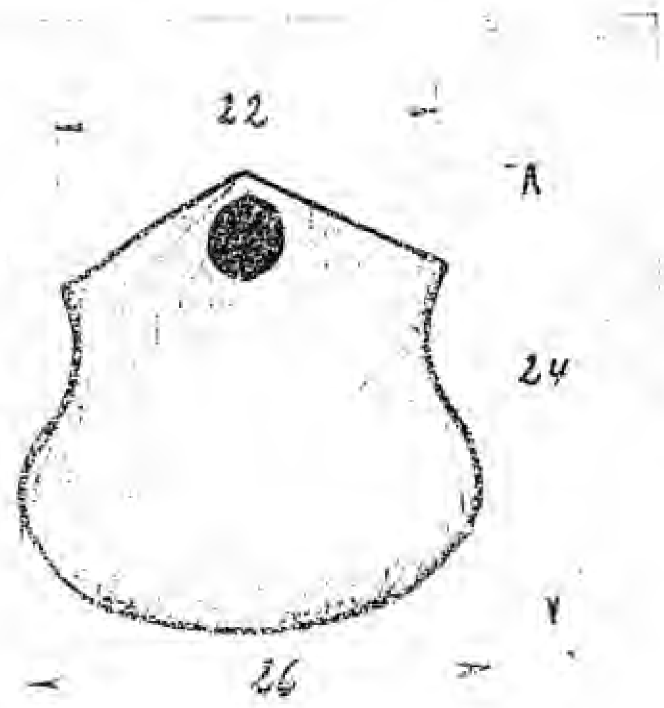


Fig. 26. *Type of hoe used in Kunduz (Kataghan Province)*

Fig. 27. *Hoe used in Kunduz (also sickles). Handle about 1.25 m. long. In using it the worker has to bend down. The handle is fixed in a round eye-hole. (Weight approximately 2-2.5 kg)*



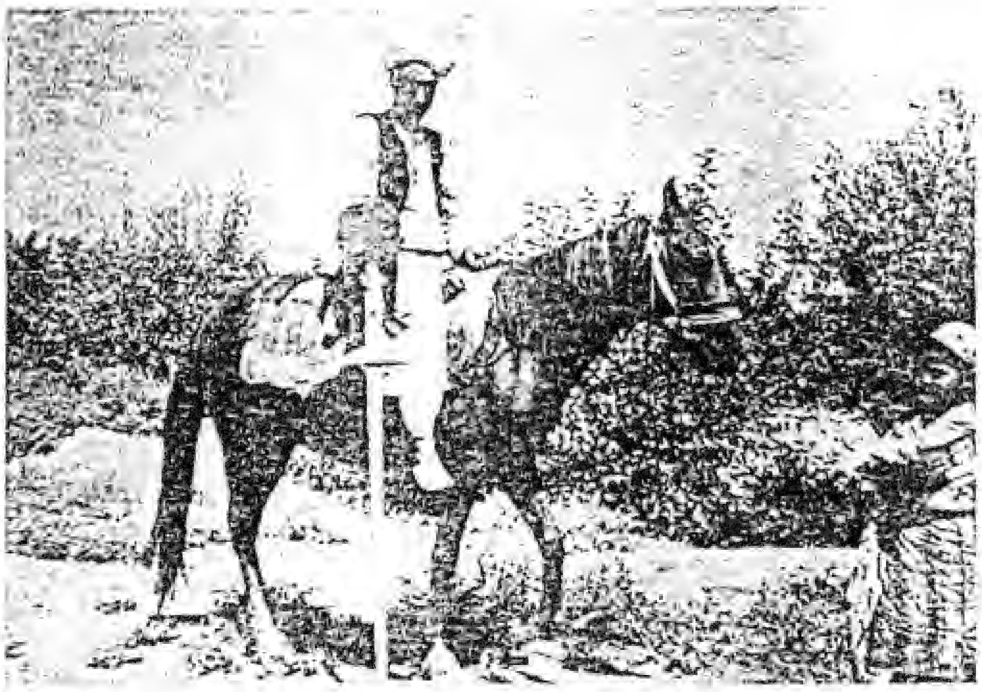


Fig. 28. *Farmer in Kunduz on way to field, with typical well-made spade used in Kataghan Province*



Fig. 29. *Spade used in Jarasia (Kabul Province). Length of handle 1.44 cm., greatest width 26 cm, length of blade 27 cm.*

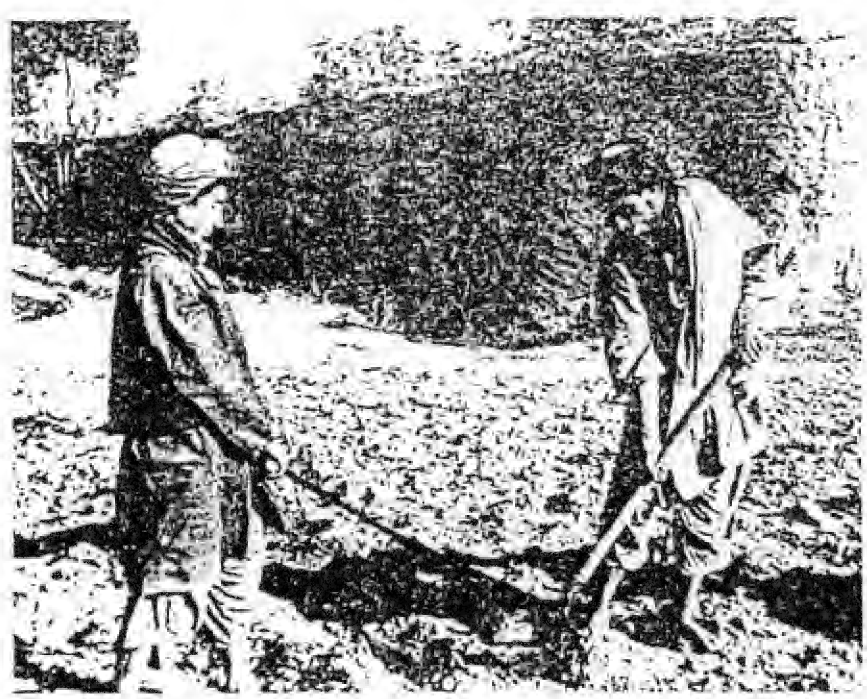


Fig. 30. *Making ridges with a wide spade. One man holds the spade, the other pulls the string. With a suitable hoe the work could be done by one man*



Fig. 31. *Smith in Khanabad. Man in background handles bellows*

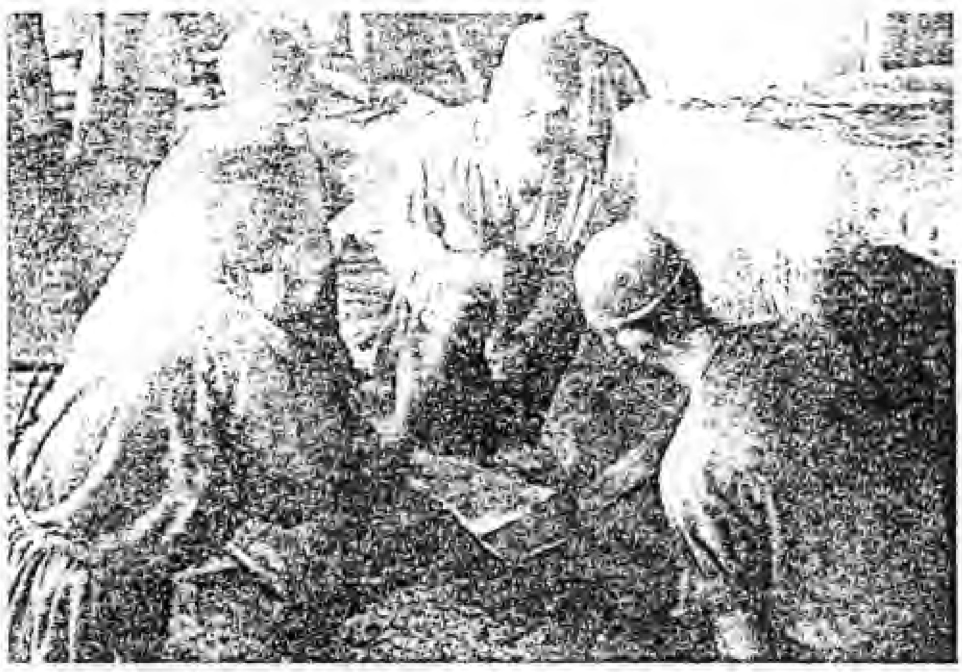


Fig. 32. *Hammering red hot iron*



Fig. 33. *Finished products*

Fig. 34. (right) *Threshing floor at Shibarpass*

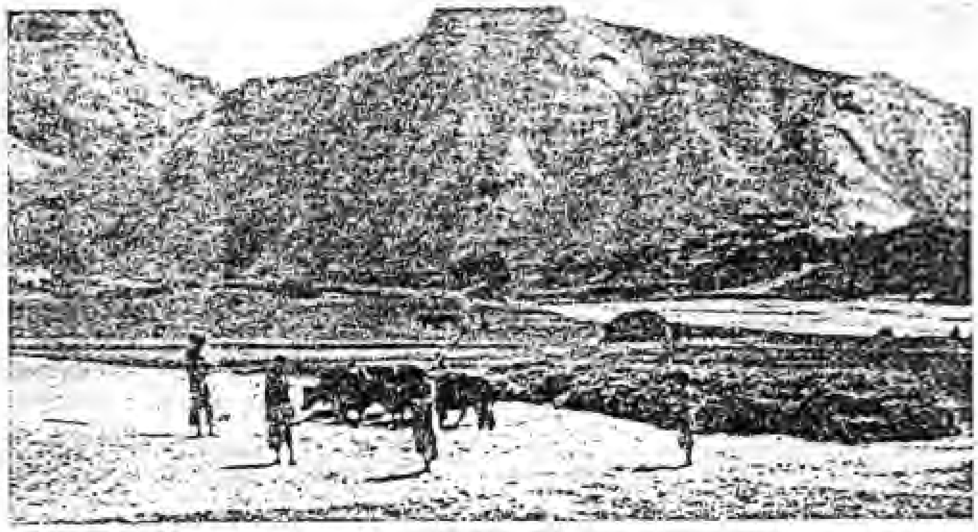
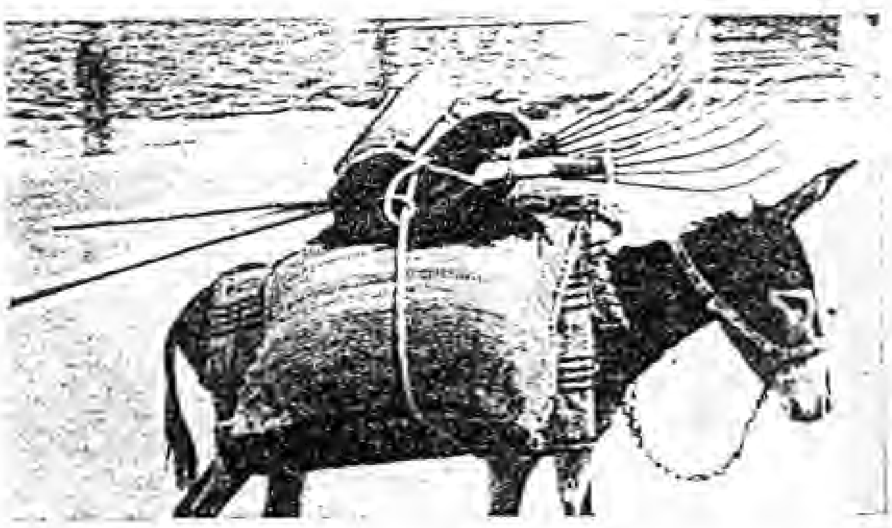




Fig. 36. (left) *Threshing place at Kandahar. After winnowing, straw and grain are separated. Grain and parts of ears to be threshed are sifted*

Fig. 35. (right) *Donkey with wooden forks and sifter on the way to threshing place*







Figs. 37 and 38. *Threshing of remaining ears*

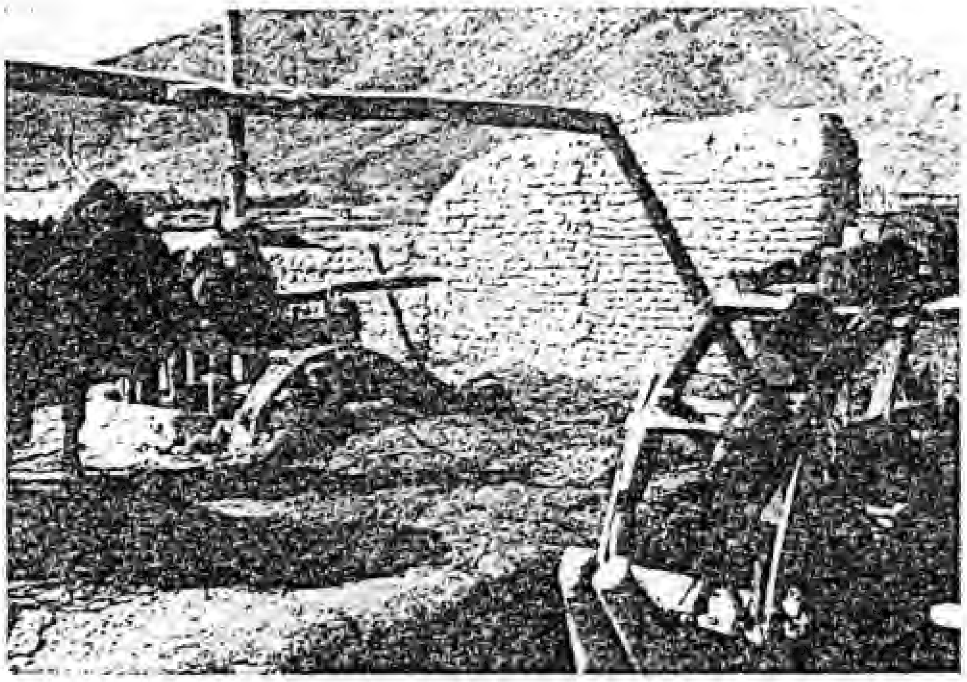


Fig. 39. *Water-wheel (Arat) at Aliabad near Kabul. Ancient type*

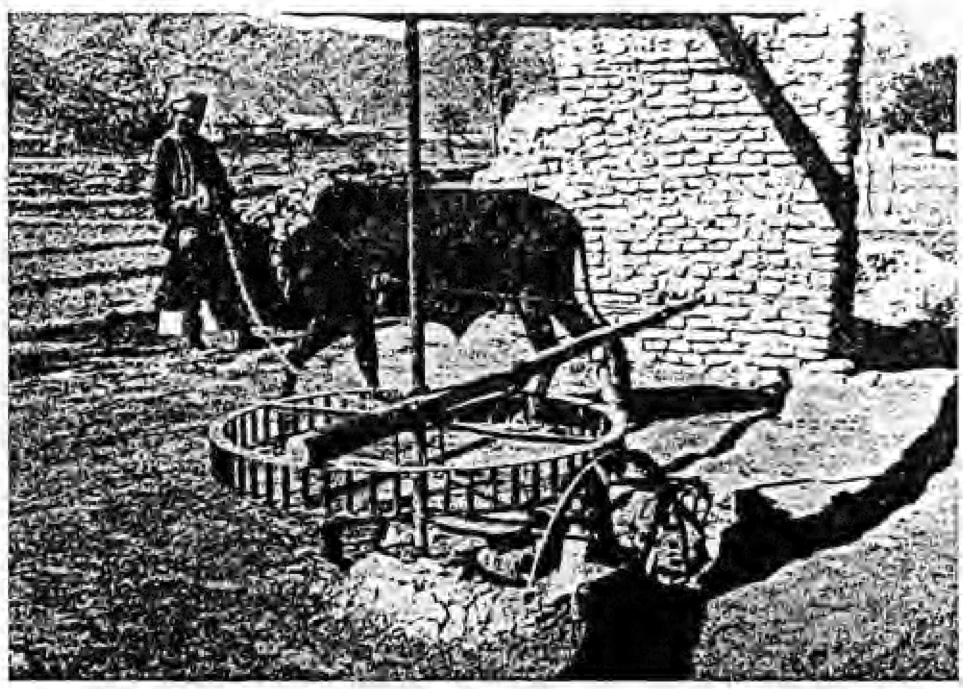


Fig. 40. *Water-wheel at Aliabad near Kabul. Improved type. More efficient transmission of power*

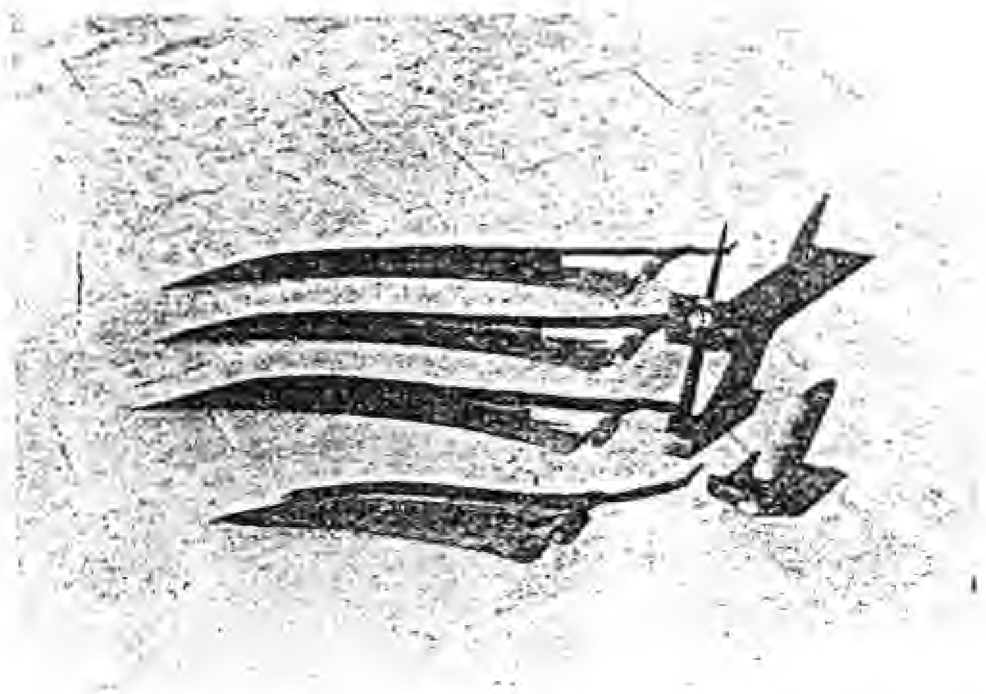


Fig. 41. *Scythes supplied by Austrian Scythe and Sickle Manufacturers. Blade lengths, from front to back: 45 cm. (shrub scythe), 65 cm., 70cm., and 75 cm. At the right, small anvil with hammer*

Fig. 44. *Scythe used at demonstration in Jarasia*





Fig. 45. *Mowing student in Argandeh ; behind him the author. The Afghan farmer is using the scythe very skillfully. He learned to mow in a very short time*

Fig. 46. (right) *Group of mowing students in Jardeh*





Fig. 47. (left) *Hammering instruction*

In accordance with this agreement a team of small implement experts was sent to Afghanistan, with Dr. W. Sommerauer in charge, along with Messrs. Robert Hartmann and Wolfgang Faiss of the Austrian Combined Scythe and Sickle Manufacturers as assistants. The latter organization also supplied a specially equipped jeep, most of the implements for the demonstration, and a considerable number of scythes for distribution to Afghan farmers.

Dr. Sommerauer remained in Afghanistan from June 22 to October 14, 1951. Messrs. Hartmann and Faiss arrived in Kabul on June 26 and left the country in November 1951. On September 29 the members of the team separated. Messrs. Hartmann and Faiss went to the districts of Farah, Herat, Maimana and Mazar-i-Sharif to distribute scythes and give further demonstrations. In the meantime demonstrations were arranged in the Eastern Province (Jalalabad) and scythes distributed in the neighborhood of Kabul, where demonstrations had been given.

Before the team could proceed with the assignment, it had to establish relations with the Royal Afghan Department of Agriculture, which, at the time, was headed by the Vice-Director, Mr. Taraki. The team worked mainly with Mr. G. Siddik, the head of the Technical Section of the Department. The Department of Agriculture gave its support wherever possible, and this opportunity is taken to express the team's sincere thanks to all those officials of the Government who helped the mission.

The information contained in the present report is based on research and observations made in the Provinces of Kabul, Kataghan, Kandahar and the Eastern Province. Only in the Province of Kabul, however, was it possible to undertake a detailed study.

AGRICULTURAL IMPLEMENTS USED IN AFGHANISTAN

The implements mainly used in Afghanistan are the plough (espar), shovel harrow (rakol), levelling board (mahla), moving sickle (dass), weeding sickle (kala), hoe (ketman), spade (bel), shovel (bel), sifter (galbeel) and wooden fork (schachie).

Inventory of Implements on Farms

Comparison of the inventories of various farms reveals that the types and numbers of implements used are more or less the same in all the districts visited. A detailed study of the main implements used on 12 farms in the Province of Kabul, set out in Table I, indicates the sort of equipment found on farms in Afghanistan.

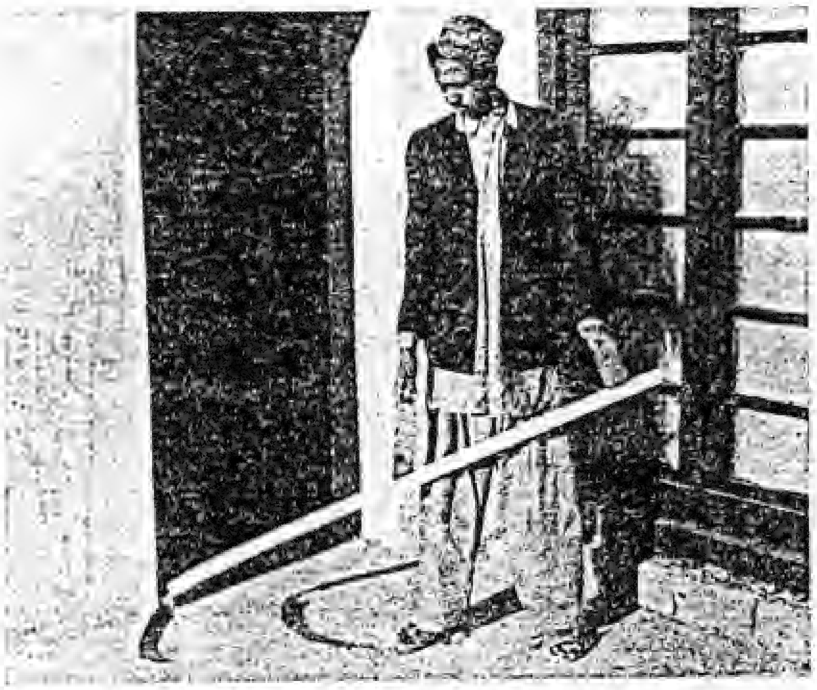


Fig. 48. *Scythe with usual handle*



Fig. 49. *Scythe with simple grain-layer consisting of a wooden bow*



Fig. 50. *Swiss type of frame scythe. So-called "Fahnli" (pennon)*

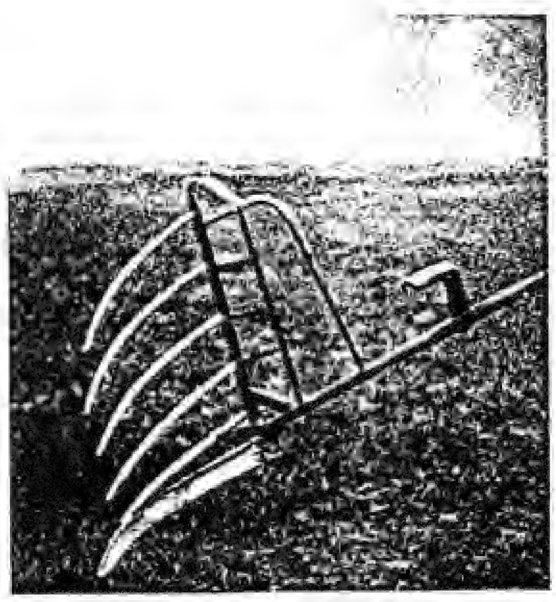


Fig. 51. *Swiss type of grain cradle*





Fig. 52. *Mowing with cradle in the north of Switzerland. Work is very accurate* Fig. 53.

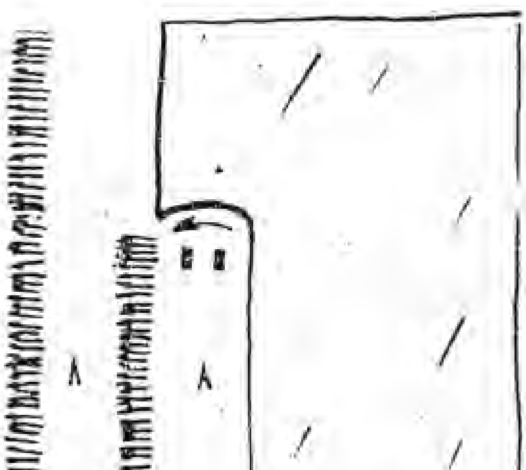


Fig. 54. *Diagram of rice or grain mowing with a cradle, showing swaths*



Fig. 55. *First rice mown by the author. If rice is low, it can be mown with a simple grain-layer*

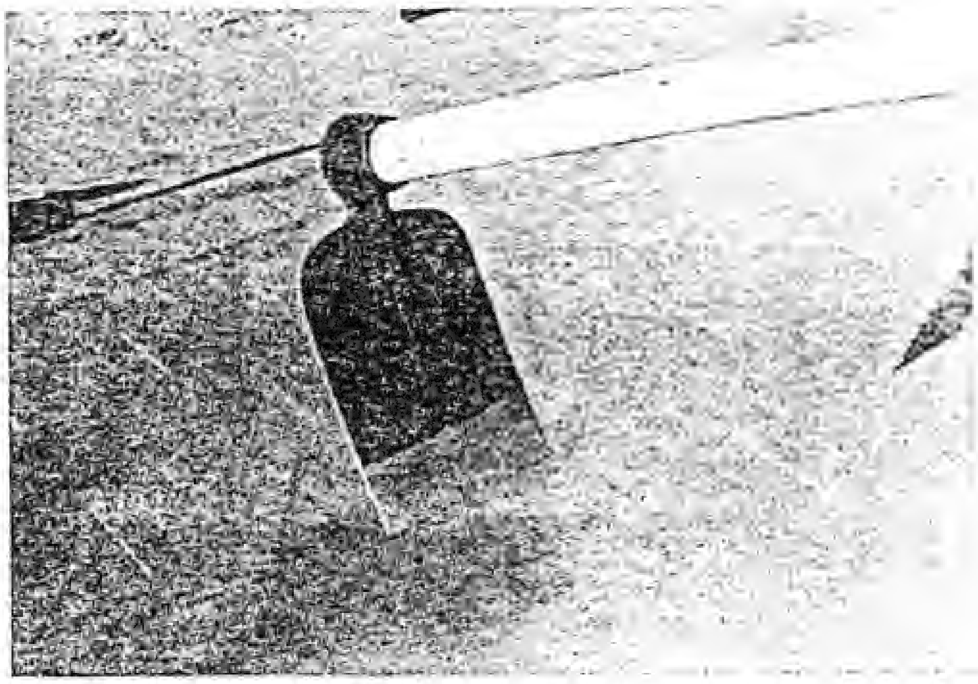


Fig. 56. *Rectangular digging hoe. Blade is 18 cm. wide and 22.5 cm. long and is attached to the handle at an angle of approximately 75°. The eye-hole is round and has a diameter of 4.5 to 5.1 cm.*

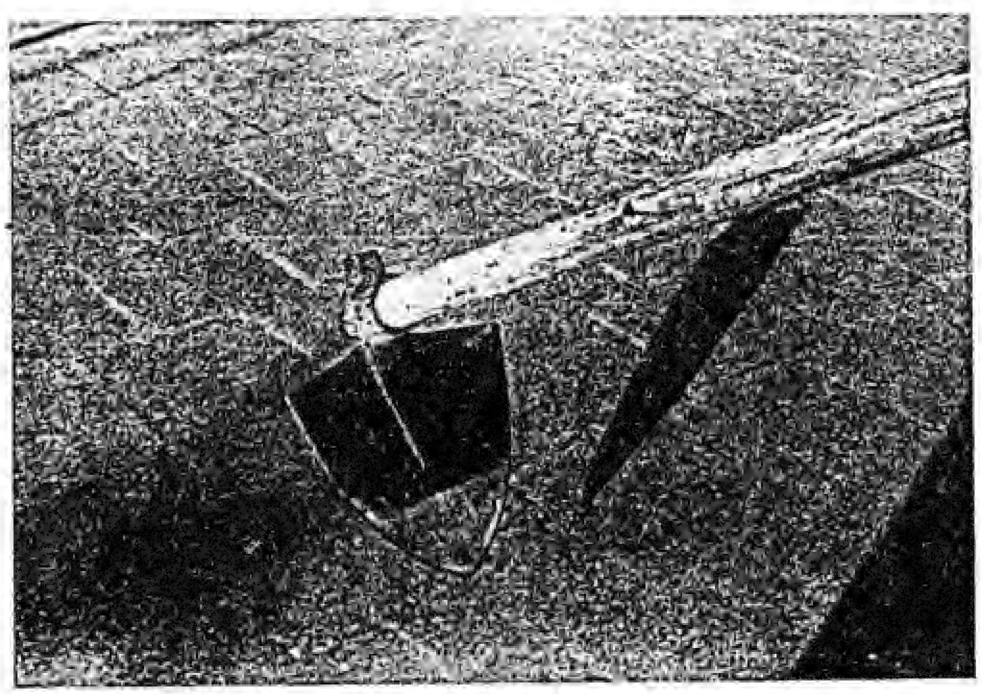
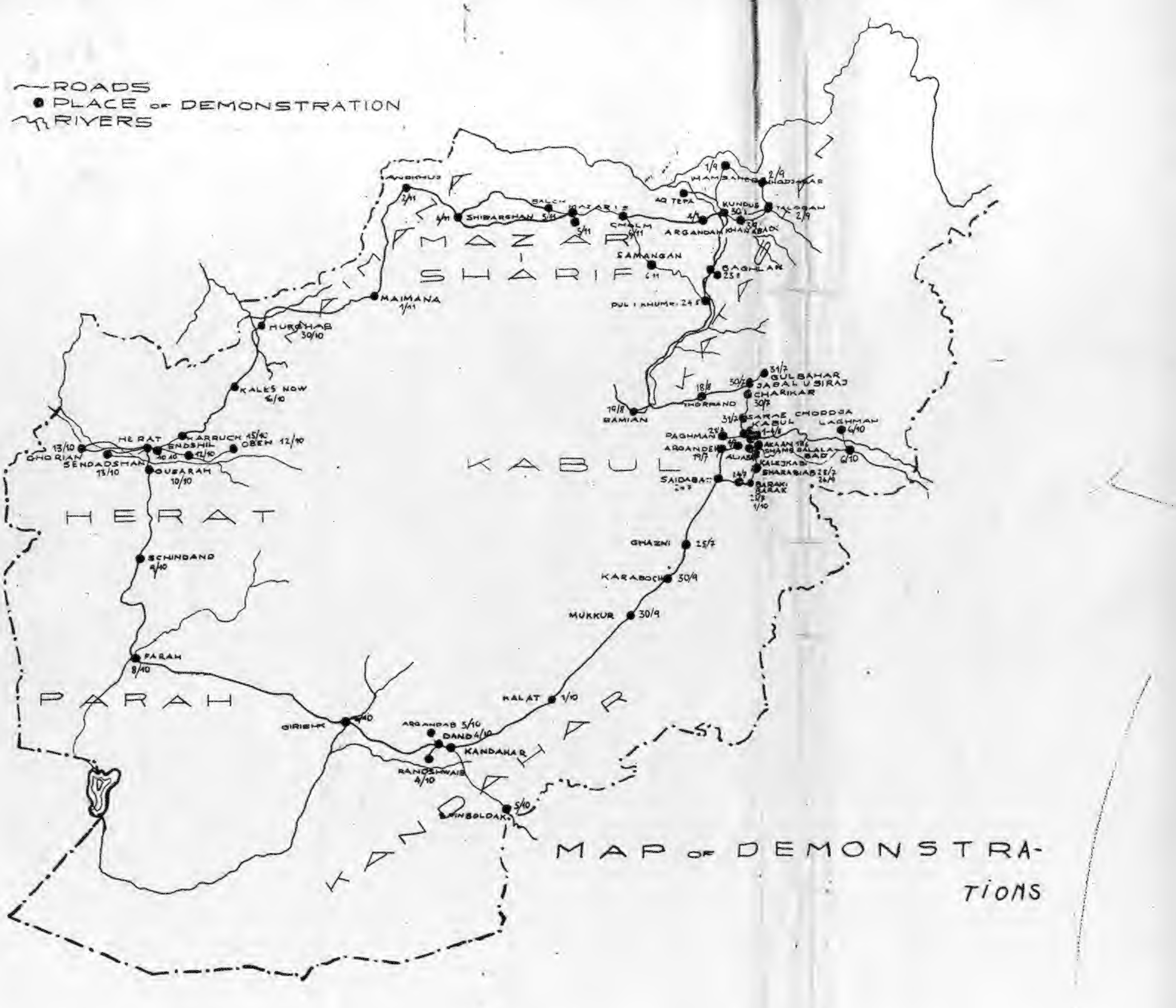


Fig. 57. *Heart-shaped digging hoe. At the top the blade is 21 cm. wide. It is 19.5 cm. long and the angle between blade and handle is about 85°. The round eye-hole has a diameter of 3.5 to 4 cm.*



MAP OF DEMONSTRATIONS

Table I: Survey of Implements in Kabul Province

District:	Kaleakasi		Jardeh			Jarasia		Baraki			
Farm No.	1	2	3	4	5	6	7	8	9	10	11	12
Size (Acres)	30	30	15	20	10	30	25	30	10	50	7.5	15
Cultivated Acres	22.5	22.5	15	20	10	22.5	18.5	22.5	10	48	7.5	15
Fallow Acres	7.5	7.5	–	–	–	7.5	6.5	7.5	–	?	–	–
No. of Oxen	2	2	2	2	2	2	2	2	2	6	2	2
Ploughs (espar)	3	3	3	3	3	3	3	3	2	9	3	3
Shovel Harrows (Rakol)	1	1	1	1	1	1	1	1	1	3	1	1
Levelling Board (Mahla)	1	1	1	1	1	1	1	1	1	3	1	1
Mowing Sickles (Dass)	6	5	5	6	4	4	4	4	4	6	4	3
Weeding Sickles (Kalá)	4	4	3	3	2	2	2	3	2	3	–	1
Hoes (Ketman)	–	–	–	–	–	–	–	–	–	–	–	–
Spades (Bel)	2	2	5	5	4	2	2	2	2	6	2	3
Shovels (Bel)	1	1	2	2	1	1	1	1	1	3	1	1
Sifters (Galbeel)	2	2	2	2	2	2	2	2	2	3	2	2
Wooden Forks (Schachie)	2	2	4	4	2	3	3	4	3	9	4	3

The number of animal-drawn implements (Espar, Rakol, Mahla), depends on the number of available oxen. In the Province of Kabul there are 3 ploughs, 1 rakol and 1 mahla to every yoke of oxen. In the Kabul Province hoes are never used for weeding. The farmers use instead a small weeding sickle (kala).

Important factors from an economic point of view are: the purchase price of the implements, their length of life, and maintenance costs. Enquiries made at various farms produced these figures:-

Table II: VALUE AND LENGTH OF LIFE OF AFGHAN IMPLEMENTS

	Value when new in Afghanis *	Average Life, in Years
Plough: Wooden parts	50	10
Ploughshare (Iron)	15	2
Shovel Harrow (Rakol)	100	12
Levelling Board (Mahla)	40	10
Mowing Sickle (Dass)	25	5
Weeding Sickle (Kala)	8	5
Spades (Bel)	40	4
Shovels (Bel)	25	6
Sifters (Galbeel)	12	5
Wooden Forks (Schachie)	10	8

* Conversion official rate: 1$ = 12 Afghanis
(1951) Free rate: 1$ = 33-35 Afghanis

In terms of money, the implement valuation on any farm is low. The cost of the implements on the 12 farms detailed in Table 1 is, therefore, about 30 Afghanis per acre.

Local craftsmen are almost entirely responsible for the supply and maintenance of implements. In various villages of the Kabul Province farmers and local craftsmen have agreements, whereby the farmer gives the local blacksmith and the joiner an annual payment, in wheat, and he supplies the required iron as well as the necessary timber. In return, the joiner and the smith carry out all repairs and manufacture all new implements in the course of the following year. On a farm of about 20 acres in Jarasia, where it was possible to make a careful study of the economic aspect, the cash expenditure for implements per annum amounted to 12 Afghanis per acre, which is about a third of the capital valuation, but, of course, this annual expenditure is for replacements as well as for repairs.

Draft Power and Harnesses

Most of the draft implements used are drawn by oxen in a double yoke (Fig.1).* The live weight of oxen ranges from 350 to 450 kilograms (770 to 1000 pounds). The animals are controlled by word of command and a stick. Head halters are not usually used.

* Figures referred to hereafter are contained in Part V - "Illustrations" of this report.

The drawbeam of the plough is suspended in a ring, attached to the middle of the yoke. The straps round the animal's throat are frequently too tight (Fig. 2), which must handicap the beast.

CULTIVATING IMPLEMENTS

The Plough

There are two principal types of ploughs in Afghanistan. One of them is used mainly in the Kabul Province and the other in the Provinces of Kataghan and Mazar-i-Sharif (Fig. 3).

The type used in the Kabul Province is shown in Fig. 3. With it a horizontal cut is made with the share; the soil is then lifted and dropped on both sides by the bottom of the plough, leaving an open furrow. The horizontal cut runs right through, so the furrow bed is even. The main difference between the work of this plough and that of the modern mouldboard plough is that the soil is merely broken and not turned.

Three variations of this plough are used, differing mainly in the size of the shares. The medium size (Fig. 3) is used for ploughing stubble, i.e. after wheat, maize, alfalfa, etc. The larger model is used for untilled soil, or for second ploughing. Ploughs with small shares are employed for covering cereal seeds with earth. As the plough merely breaks up the soil, several crosswise ploughings are necessary for the preparation of seed beds.

In preparing for maize or clover the following method is generally used: a field is ploughed two or three times in the course of several days. If there is any unevenness this is levelled out with a kind of shovel harrow (rakol). The field is then flooded with water until only a few clods of earth are visible, after which it is allowed to dry until the soil is only comparatively damp. The farmer now goes over it with a levelling board (mahla) to crumble and flatten the clods. Sowing is done by hand, and the seed covered immediately by the small-share plough. The field is finally levelled with the mahla.

The advantages of the Afghan plough over a mouldboard plough are: (a) Low purchase price and maintenance cost. (b) Easy handling, which is of particular advantage on the small areas of terraced slopes. (c) When ploughing the edge of a field no open border furrows are formed.

The disadvantages are: (a) Low working capacity, due to the fact that it is necessary to plough several times to prepare the seed bed. Actually the plough performs much of the work done in other countries with a harrow. (b) Weed seeds are not buried deeply enough. They remain in the top layer of the soil and can easily germinate. Weeds with tough roots, such as camel thorn and others, are often not cut off. (c) Inadequate ploughing under of stubble and roots,

making subsequent cultivations practically impossible and the growing of fodder and other green crops very difficult.

The second type of plough is used in Kuadus, Province of Kataghan. (Figs. 7-10). The body and handle of this implement are in one piece. The share is practically cone-shaped with lateral wings, and it is fixed to the end of the wooden plough body. No detailed study of this plough was possible.

At first sight it appeared to the FAO team that the Afghan ploughs were adequate for the special conditions prevailing in the areas visited. After closer observations, bearing in mind the need to produce more food crops with the same labour force, it seemed apparent that Afghan agriculture would benefit considerably by the introduction of a one-way mouldboard plough. The limited draft power available, in the form of oxen, is borne in mind, so specific recommendations of existing types of ploughs cannot be made without further study. There are light-draft ploughs of this description on the European market, several versions of which, it is suggested, should be acquired. These could be modified, perhaps, to suit local conditions; tested again, and by a process of trial and error a more efficient tool could be evolved. Careful note would have to be taken of the effect of such a modern plough on the physical condition of the soil.

Should a better type of plough be produced by this suggested method — as seems probable — there remains the question of whether the Afghan farmer could afford to buy it. Some form of cooperative ownership might be the solution; but that is a matter for consideration when the merits of the new implements are established.

The Shovel Harrow (Rakol)

The rakol is a form of harrow made of wooden boards. It either has an iron plate in front or five small iron shovels (Figs. 12-13) attached to the front board. The implement is used for moving soil, as a tilth making tool and for the levelling of fields, necessitated by the usual method of irrigation. A rakol is drawn by two oxen.

The Levelling Board (Mahla)

The mahla is a form of clod crusher and leveller about 160 to 40 cms. (63 by 15 inches). The farmer stands on the board, slightly tilting it in front. When the soil has the correct moisture content it is readily crumbled for the preparation of a seedbed. Another levelling implement seen in the Province of Kataghan is a wooden beam, about 2 metres (6 ft. long) (Figs. 14-15).

The Weeding Hook or Sickle (Kala)

In many regions of Afghanistan hoes are unknown. For weeding, small hooks are used (Fig. 25). The squatting position of the operator and the poor design of this tool limits the output considerably. A man weeding a mixed field of spinach and onions in the neighborhood of Kabul was able to cover an area of only 8 sq. metres ($9\frac{1}{2}$ sq. yards) in one hour, compared with the standard of most other countries.

The lack of suitable weeding implements is probably the c[illegible] reason why many fields get no after-cultivation and are therefore full [illegible]eds. The weeds deprive the cultivated plants of light, nutritive materia[illegible] water, and, consequently, reduce their yields. Further, this lack o[illegible] suitable tools would appear to be the chief reason why the cultivation of vegetables and other special crops has not been sufficiently developed.

The Hoe (Ketman)

Chopping hoes are rare, and were seen only in the provinces of Kataghan and Mazar-i-Charif. (Fig. 26). As the material used for the blades is not hard enough, they are made thick on section in order to be sufficiently resistant; consequently they become blunt easily. The shape of the hoes is somewhat clumsy and not suited for light surface hoeing.

Spades and Shovels (Bel)

Spades and shovels are well developed in Afghanistan and the types used are similar to those used in Europe. The shapes vary in the different region (Figs. 28-33). Fig. 33 illustrates some local products which show evidence of a highly developed technique. In the centre of the illustration there is a well-shaped shovel; beside it there is a spade, which grows spatulately wid at the lower end, and which is characteristic of the region. Fig. 29 shows a pointed spade of the type found in the Kabul provinces.

HARVESTING IMPLEMENTS

The Mowing Sickle (Dass)

Two types of sickles were noted: 1) those with short handles used by the operator in a squatting position, and 2) those with long handles.

The short-handed sickle. This is the commonest type. The length of t[illegible] shaft and its method of attachment to the handle vary in the different regio[illegible] (Figs. 16-20).

Blacksmiths frequently use the springs of old automobiles or other scrap iron as raw material for making blades. Consequently, they are not of uniform hardness. The red hot steel is hammered to the right shape and size. After cooling, the edge of the sickle is sharpened by hammering, but hardening by tempering is not commonly done; although the art of hardening is not unknown and is practiced by some of the blacksmiths (Fig. 21). The handles of the sickles are usually made of soft wood.

The long-handled sickle. This is used less than the short-handled type (Figs. 22-24). The implement is a cross between a sickle and scythe. The fact that the worker has to bend down to mow, and the unpractical handle which gives incomplete purchase, cause great fatigue. Though its working capacity may be somewhat higher than that of the short-handled tool, the quality of the work is not particularly good.

General Comments. The shape of the Afghan sickle blade is good, the handle is practical and it provides a good grip. On the other hand, the quality of the blade is often poor, the material used being too soft. Great improvements could be made by better sharpening and tempering. For sharpening blades in the field a stone about the size of a fist is used as a whetstone. Very few well-sharpened sickles were seen. Most of them were blunt and jagged, which results in poor work, low output and greater fatigue for the worker.

Having noted the defects of the Afghan sickles and tentatively come to the conclusion that scythes would be superior in every way, field studies were made, in the Bamian Valley and at Baghmar near Kabul. These were designed to ascertain how much effective work was done in a given time with the two sorts of mowing tools.

When the Afghan sickles were used the whole of the operations were broken down into actual cutting times, time taken to get to the field, to sharpen the blades, gather the mown crops, rest intervals and moving from swath to swath. Because it was not possible to record similar tasks, using scythes, only the actual mowing times are noted.

It was, however, abundantly clear that the scythes were much more rapid and did better work with less effort on the part of the operators, and this despite the fact that they had not entirely mastered the technique of handling scythes. Comparisons are noted later in this report.

THRESHING EQUIPMENT

Threshing operations commence as soon as possible after the harvest. A layer of grain about a foot high is spread on the ground with a three-prong

wooden fork (schachie). The stalks and ears are trodden down by oxen drawing a kind of threshing slide (dschugol), until the straw is reduced to a length of about 4 to 6 cms. ($1\frac{1}{2}$ to 3 inches). Then more grain is spread on the ground and the performance repeated until the whole of the heap is threshed. To separate the straw from the ears and grain the peasants use a five-prong wooden fork. The grain and ears are then spread out again and threshed by 3 to 5 oxen without the slide, tramping the heap. The grain is now sifted with a galbeel. Unthreshed ears are beaten out with a thick stick; two-piece flails are not used. (Figs. 34-38).

This method of threshing is very slow and interferes with wheat harvest Furthermore, seeds are not cleaned sufficiently; grain is mixed with particles of soil, small stones and weed seeds. The advantages of the method are that it involves no actual cash expenditure and that the straw is split into small pieces ready for feeding. Improvement in threshing methods is urgently require

Other Implements

Carts are hardly ever used on farms in Afghanistan, loads generally be carried by donkeys. Very few of the plots are near usable roads, and nearly al the existing roads are in bad condition.

In some of the plains water-wheels (Arat) are used, and are operated by animal-drawn gear (1 or 2 oxen). (Figs. 39-40).

DEMONSTRATIONS OF SMALL FARM IMPLEMENTS

Itinerary and Implements demonstrated

The main function of the mission was to demonstrate the use of modern implements, and to determine whether or not they were suitable for Afghan conditions; as well as to see if the farmers could readily master the handling of these European tools.

This was done in all the principal agricultural regions of the country. The team generally travelled in two jeeps, one of which was supplied, together with special equipment, by the Austrian Combined Scythe and Sickle Manufacture and the other by the Department of Agriculture. The Department also provided a German-speaking interpreter and two observers. The map facing page indicates places and dates of the demonstrations. An average of 110 spectators attended ranging from 25 to 400.

The implements demonstrated were scythes, forks, hand rakes, sugar-bee lifters, digging hoes and pulling hoes.

EXPANDED TECHNICAL ASSISTANCE PROG[...] . 23

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
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SMALL AGRICULTURAL IMPLEMENTS

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Contents

FAO/52/8/4728